

Atmospheric Composition & IG³IS

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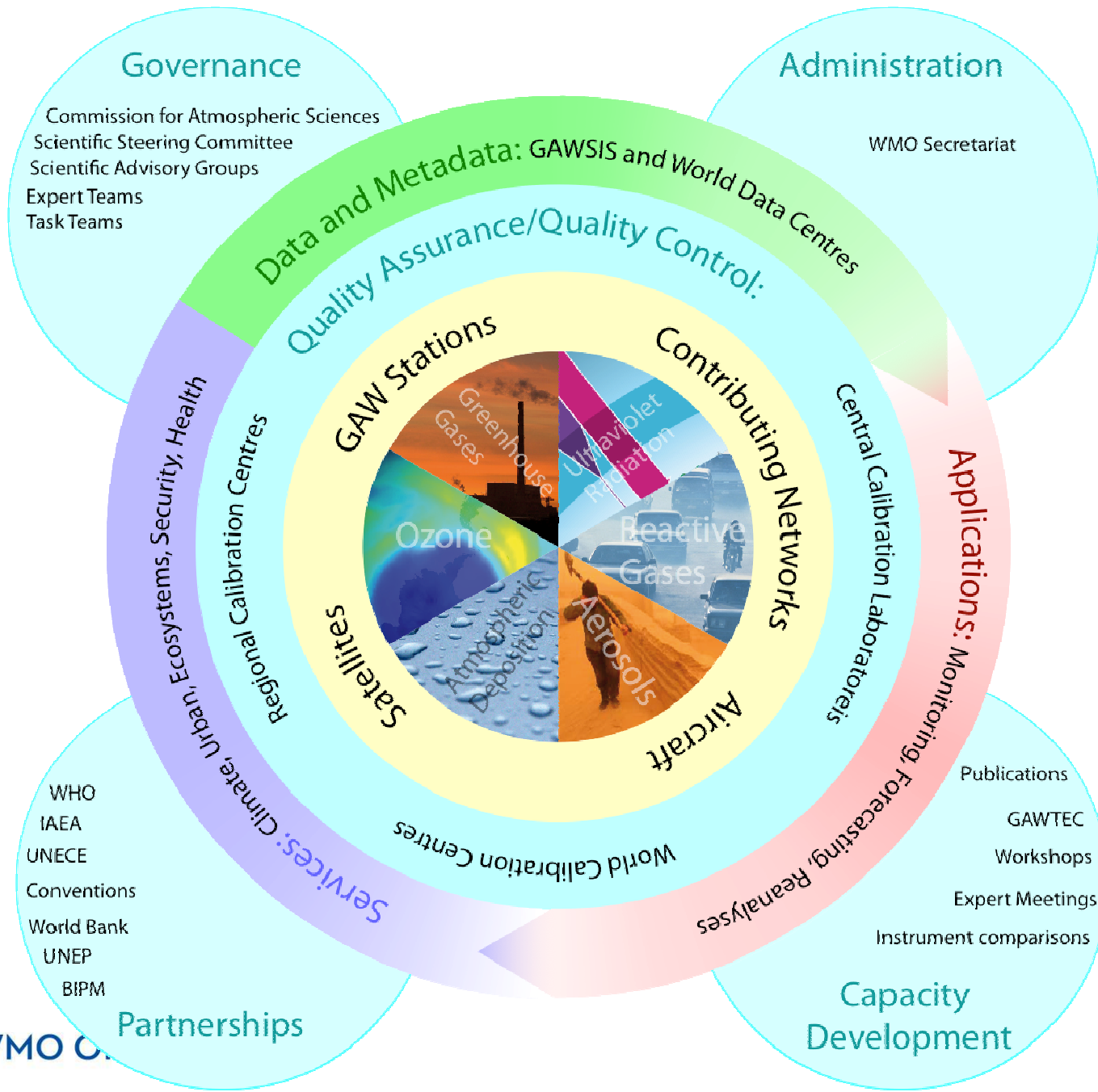


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World Meteorological Organization
Organisation météorologique mondiale



The GAW System



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The GAW Structure

Governance

Scientific Advisory Groups,
Expert Teams,
Task Teams

GAW
Secretariat



Commission for Atmospheric
Sciences,
Environmental Pollution and
Atmospheric Chemistry
Scientific Steering Committee

Quality Assurance

Quality Assurance & Science Activity Centres
World & Regional Calibration Centres

Central Calibration Laboratories
Host GAW World Reference Standards

Observing Systems

Contributing
networks

GAW stations & GAW SIS



Satellites & Aircraft

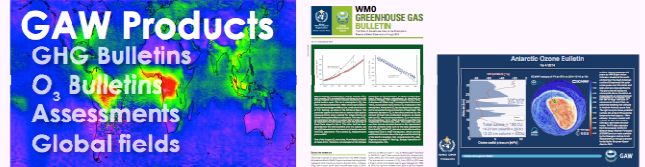


Data and Products

**World Data
Centres**



GAW Products
GHG Bulletins
O₃ Bulletins
Assessments
Global fields



Applications, Services, Users

Operational
Centres
SDS-WAS...

Programmes
IGAC, WCRP...

Systems
GCOS, GEO...

Conventions
UNFCCC, Vienna...

Projects



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Establishment of TT-ObsReq

In 2011, the World Meteorological Congress recommended for GAW to set up an ad-hoc Task Team to review the needs for GAW regarding satellite measurements and the IGACO recommendations on these that date back to 2004. Congress further recommended that this work be done in coordination with the CBS Expert Team on Satellite Systems (ET-SAT) and the Expert Team on Evolution of the Global Observing Systems (ET-EGOS), the Committee on Earth Observation Satellites (CEOS) Atmospheric Composition Constellation group and the Coordination Group for Meteorological Satellites (CGMS) and also taking into consideration GCOS requirements and the vision for the GOS in 2025.

TT-ObsReq

- Task team was established in the autumn of 2014
 - List of members:
<http://www.wmo.int/pages/prog/arep/gaw/documents/TT-Members-2015-07-10.pdf>
 - Meeting reports and other relevant documents:
<http://www.wmo.int/pages/prog/arep/gaw/TaskTeamObsReq.html>

Task Team meetings

- First meeting in November 2014
 - Decision to define three application areas for the atmospheric chemistry theme:
 - I. Forecasting Atmospheric Composition
 - II. Monitoring Atmospheric Composition
 - III. Providing Atmospheric Composition information to support services in urban and populated areas
- Second meeting in August 2015

Requirements: Priority variables

- **Important across all 3 application areas:**
- **Aerosol:** PM_{2.5}, PM₁₀, BC, Dust (speciated), OA (including SOA), AOD, AAOD, wet deposition (speciated)
- **GHGs:** CO₂, CH₄, CFCs, HCFCs, N₂O
- **Reactive Gases:** O₃, SO₂, NO₂, CO, NH₃, HCHO, Isoprene, VOCs (speciated), HO_x
- Isotopes, water vapour
- **Also:** TOA and surface short/long-wave radiation, actinic flux, UV
- Others (which we may/will not set requirements for): clouds, PBL, tropopause height.

Involvement of SAGs

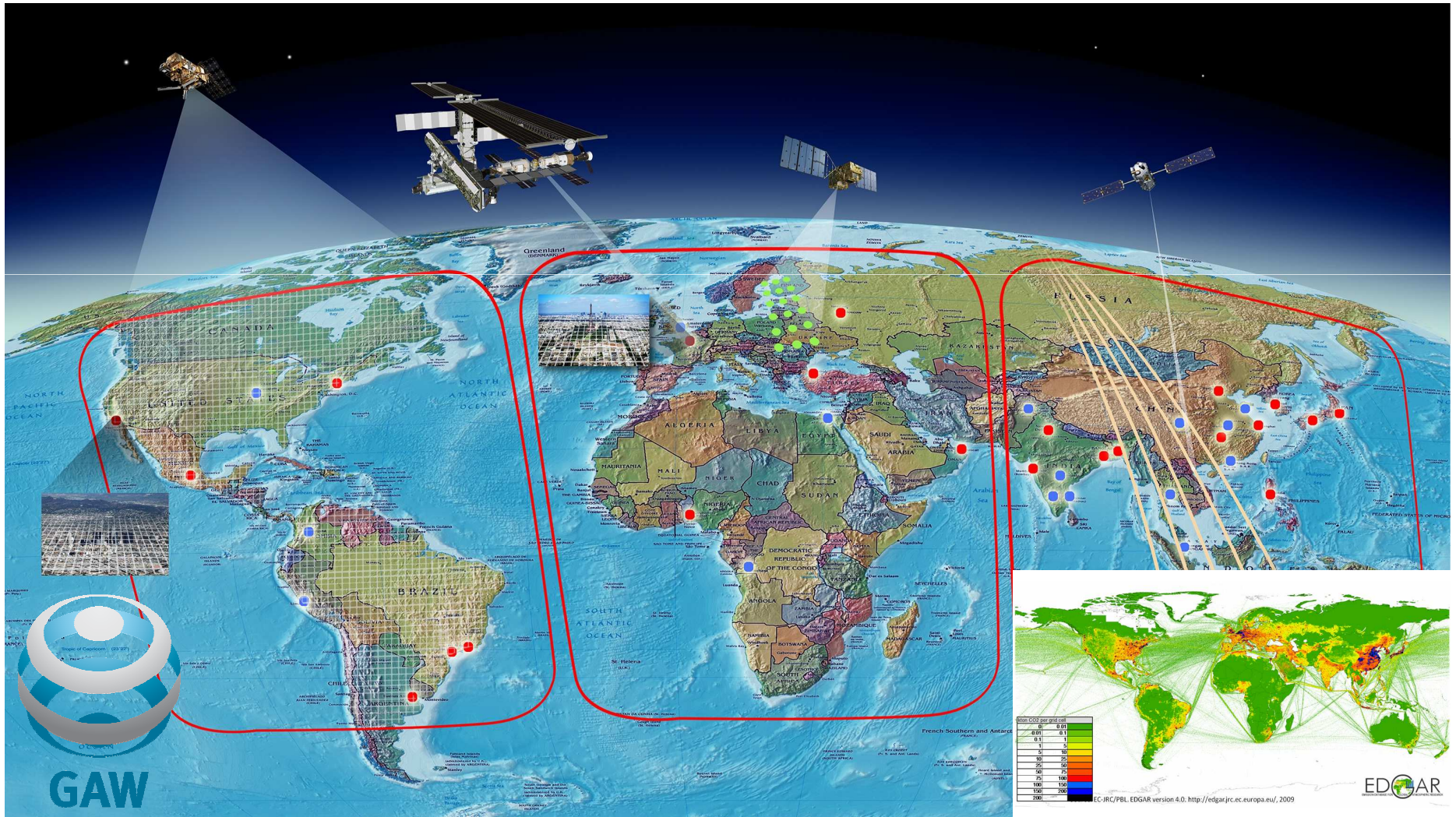
- The Scientific Advisory Groups of GAW have been engaged to work on the observational requirements for their respective parameters
- Three SAGs have responded with Excel sheets with detailed requirements
 - Greenhouse Gas SAG
 - Reactive Gases SAG
 - Solar UV Radiation SAG
- These Excel sheets have been passed on to the OSCAR team for ingestion into the OSCAR database

More details

- More details about the input received so far can be found in the submitted document

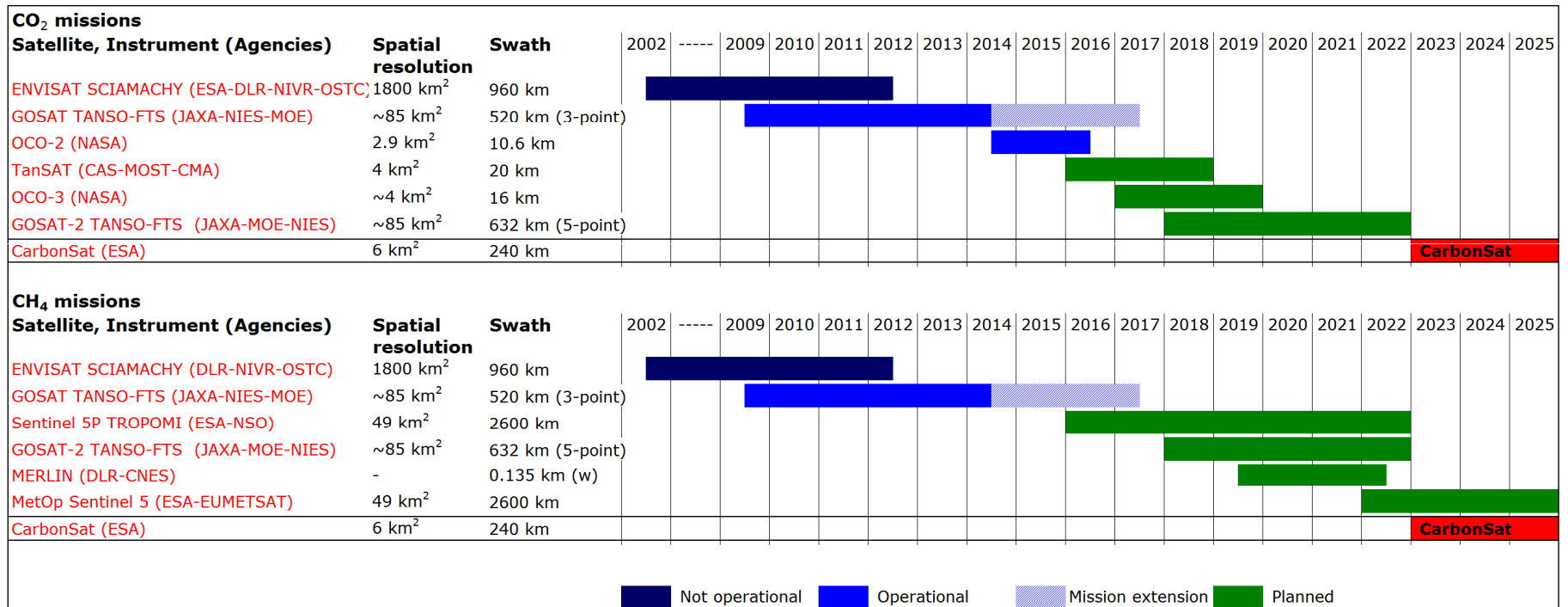
Integrated Global Greenhouse Gas information System

IG³IS



Current & planned satellite sensors for measuring

X_{CO_2} and X_{CH_4}



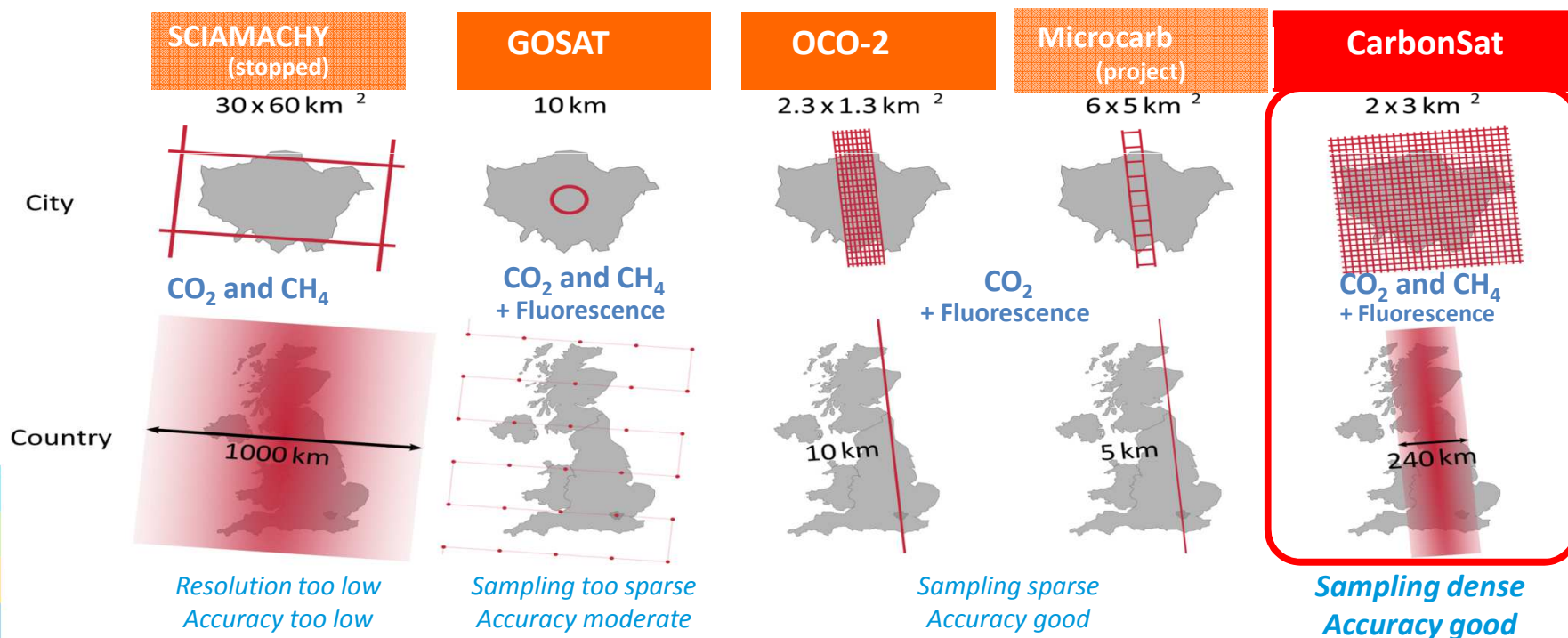
Requirements for quantification of sources & sinks

Objective	Temporal scale	Spatial scale (N-S) km x (W-E) km	Accuracy				Unit	Comment
			Goal	Breakthrough	Threshold			
CO ₂ Regional Land	Monthly	500 x 500 ¹	0.2	0.5	1	gC m ⁻² day ⁻¹	Corresponds to 5-14 MtCO ₂	
	Annual		0.05	0.1	0.25		Corresponds to 17-33 MtCO ₂	
CO ₂ Regional Ocean	Monthly	1000 x 2000	0.005	0.01	0.03	gC m ⁻² day ⁻¹	Corresponds to 1.1-2.2 MtCO ₂	
	Annual		0.005	0.01	0.03		Corresponds to 13-27 MtCO ₂	
CO ₂ City scale	Instantaneous (at overpass time)	N.A.	2	4	20	MtCO ₂ yr ⁻¹	For targets larger than 20 MtCO ₂ yr ⁻¹ (e.g. Paris, Los Angeles, Berlin), excluding wind speed error (this corresponds to an accuracy between 10% and 20%)	
CO ₂ Point source	Instantaneous (at overpass time)	N.A.	1	2	10	MtCO ₂ yr ⁻¹	For targets larger than 10 MtCO ₂ yr ⁻¹ , excluding wind speed error. Specified accuracy values correspond to instantaneous fluxes expressed on an annual time scale	
CH ₄ Regional	Monthly	500 x 500 ²	5	10	20	mgCH ₄ m ⁻² day ⁻¹	Corresponds to 38-112 ktCH ₄	
CH ₄ point source	Instantaneous (at overpass time)	N.A.	4	8	40	ktCH ₄ yr ⁻¹		

Requirements for future instrumentation

Future satellites should comply with the following requirements:

- **Dense sampling** : images of CO₂ and CH₄ weather and plumes
- **High spatial resolution** : capture emission hotspots and avoid clouds
- **High accuracy** : because atmospheric column gradients are small
- **Global coverage** : because most regions of the Earth have CO₂ and CH₄ fluxes



Measurement requirements

	XCO ₂ (G / B / T)	XCH ₄ (G / B / T)
Uncertainty	0.2 / 0.5 / 1.0 ppm	1 / 3 / 9 ppb
Horizontal resolution	100 / 500 / 1000 km (M) 0.5 / 5 / 10 km (U)	100 / 500 / 1000 km (M) 0.5 / 5 / 10 km (U)
Vertical resolution	Total column [PBL weight ≥ air mass contribution]	Total column [PBL weight ≥ air mass contribution]
Observing Cycle	1d / 1w / 1m	1d / 1w / 1m
Timeliness	1m / 6m / 1y	1m / 6m / 1y

(M): Climate monitoring application

(U): Urban monitoring application



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Thank you!
Merci!
Спасибо!



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